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With Traffic at a Crawl, Planners Talk of Tunnels

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For decades, underground highways in Southern California were a frustrated commuter's fantasy — too costly, too hard to build and, given the wealth of land, not necessary.

But Los Angeles is in its 18th year as the nation's most congested metropolis, freeways have little or no space for new lanes and traffic experts are running out of time-shaving options.

So civic leaders are joining engineers to consider burrowing the longest highway tunnels in America.

"Tunnels," said Wolfgang Roth, a geotechnical engineer working on one possible project in the Antelope Valley, "may finally have their day."

Three massive projects are under study in Southern California, each dwarfing any of the nation's 337 underground roadways, including the 2.6-mile tunnel in Boston's infamous "Big Dig," the most costly public works project in U.S. history:

• Congress recently approved $2.4 million to study a five-mile, $2-billion tunnel that would help link the Long Beach and Foothill freeways in Pasadena and South Pasadena, and keep 100,000 cars a day off city streets.

• For Orange and Riverside counties, Congress set aside $16 million to study a 12-mile tunnel that would connect fast-growing commuter towns in the Inland Empire to jobs on the coastal plain. Buried beneath Cleveland National Forest and projected to cost from $3.5 billion to $5 billion, it would be the second-longest in the world — after a 15.2-mile project in Norway.

• A complex of tunnels and surface highways under study by the city of Palmdale would slice 23 miles directly though the San Gabriel Mountains from the Antelope Valley to Glendale, cutting the commute in half. It could cost $3.1 billion or more.

While some policy makers remain skeptical, others say engineering breakthroughs in Europe and Japan have made tunnels faster to build and more affordable — especially where real estate prices have pushed the cost of new freeways skyward.

"The technology has evolved, so tunnels are becoming truly competitive alternatives," said Mark Pisano, executive director of the Southern California Assn. of Governments.

Giant tunnel-boring machines can drill quickly through the earth, cutting holes 45 feet in diameter. "If the hard rock stands up nice, the boring machine eats right through," said Roth. "Even with the fractured hard rock, as the machine advances, you stabilize the tunnel walls with rock bolts or 'shotcrete,' " he said, using the futuristic term for sprayed concrete.

Another benefit of tunnels is that they seem to generate less political dust than surface roads.

"There's a new interest in the invisible highway — getting them out of sight," said engineer Harry Capers, tunnels committee chairman for the American Assn. of State Highway and Transportation Officials, citing projects in New Jersey, Maryland and New England. "It's been catching on."

Nothing makes tunnels more attractive, however, than dire traffic projections.

With Southern California's population projected to grow from 18 million to 23 million by 2030 — and

with three of four motorists still traveling alone — the average speed on most area freeways during the peak morning commute is expected to drop from 34 mph to 20 mph or less.

Long tunnels, however, are not simple to build. Even the 31-mile English Channel train tunnel, an engineering wonder, took much longer than anticipated and cost double the original estimate.

Southern California, with its mountainous terrain, underground aquifers and seismic vulnerabilities, may prove the ultimate testing ground for subterranean highways.

The San Gabriel Mountains, through which the Antelope Valley connector would run, are "fault-infested," said Leon Silver, a retired Caltech professor, citing two known faults the proposed tunnels would cross.

"One has to be extraordinarily careful," he said. "There are more faults in the San Gabriels that we don't know about than we do."

Another consideration is groundwater, which can make tunnels cumbersome to construct and vulnerable to damage. Dig too deep in Cleveland National Forest, for instance, and pressure from groundwater could crack the tunnel lining. Planners say they can go no farther down than 750 feet, and may need to place some of the roadway above ground.

Roadway tunnels carry their own dangers as well. With narrow confines and limited ability to vent smoke, they've seen serious accidents.

In one 1999 crash, oil from a damaged truck caught fire inside the seven-mile Mont Blanc tunnel between France and Italy. Nearly 40 people died.

Perhaps the greatest obstacle to highway tunnels is cost, especially given the fierce competition for funds to expand rail, bus and highway systems across the state. An underground passageway can easily cost two to three times as much per mile as a freeway. The most obvious funding solutions are onerous: steep gas taxes or tolls.

"There is still resistance to tolls," acknowledged Robert W. Poole Jr., a transportation analyst and tollway advocate. Even so, he said, motorists make about 38,000 trips a day on Riverside Freeway toll lanes in Orange County, paying up to $7.75 one way.

"You cannot think of tunnels — like the Palmdale-Glendale link — as an ordinary highway route," Poole said. "They provide a premium shortcut."

Hanging over any big tunnel project these days is the specter of a Big Dig-like debacle.

The series of tunnels through central Boston has cost nearly $15 billion over 14 years, far more than forecast. For all that, Fred Salvucci, considered to be the project's father, conceded recently that it might not relieve congestion as anticipated. Tunnel trips have already reached levels expected in 2010 — in part because the Big Dig soaked up money that might have been used to expand public transit.

Indeed, tunnels alone don't have the capacity to end congestion; they must be part of a larger strategy. Los Angeles Mayor Antonio Villaraigosa, for one, wants limited transportation money spent on projects such as light rail and subways. "I think our focus needs to be on getting people out of their single-passenger automobile," he said.

Commuters are not necessarily seizing on the tunnel as their salvation, at least not in the short term. "It could take them years to make up their minds, let alone build a tunnel," said Howard Monise, a mechanic from Corona who commutes two hours a day to Santa Ana. "With all these people and homes being built, they are never going to catch up. I just hope it doesn't become unbearable."

Though tunnels are relatively common in Europe, Australia and Japan, their popularity has ebbed and flowed in the U.S.

Many of America's largest were built on the East Coast during the Depression or after World War II, when labor was cheap. More recently, large road tunnels have been constructed in Alaska, Colorado, Kentucky, Hawaii, Maryland and Massachusetts.

California has 25 highway tunnels, most built at least half a century ago, all a mile or shorter. Of the three projects proposed in Los Angeles and Orange counties, the most promising would not cross an inconvenient mountain or bay. Rather, it would bore through a political impasse.

Constructing a double-decker roadway 100 to 200 feet beneath South Pasadena and Pasadena would end a 50-year feud over completion of the Long Beach Freeway.

South Pasadena residents have blocked freeway construction to save hundreds of homes, while Alhambra residents have fought for it so 100,000 cars a day would not be dumped onto their streets. But both sides now guardedly support the five-mile tunnel, along with a one-mile surface road, to link the Foothill and Long Beach freeways.

It finally makes financial sense. Soaring real estate prices and cheaper construction methods have made the cost of putting the road below ground not much more than building it above, Caltrans officials say.

"The demand there is beyond question, and the only way to finish that project is a tunnel," Pisano said.

Tunneling through urban politics is one thing. Boring through the rugged hillsides of esteemed national forests is quite another.

Bill Vardoulis thinks it's the only option. For close to five years, Vardoulis, a 66-year-old mechanical engineer and former Irvine mayor, has championed the idea of a subterranean roadway through the Cleveland National Forest.

Traffic on the Riverside Freeway, that oft-cursed bottleneck funneling Riverside County commuters to their jobs in Orange County, is expected to nearly double to 400,000 trips a day by 2030. Even now, trips can take 90 minutes one way.

Widening the freeway won't be enough, Vardoulis said. And the only alternative route, Ortega Highway in south Orange County, is a dangerous two-lane road too constrained by narrow canyons to expand.

"Everything is developed in the flatlands," Vardoulis said. "It makes no sense to start tearing out homes to make way for [new] freeways."

The 12-mile tunnel, which would start at Interstate 15 and Cajalco Road in Riverside County and emerge east of Irvine, is one of four congestion-easing proposals under study by elected officials. They hope to select one or more by December.

But environmentalists are determined to block any project, above ground or below, that they believe would degrade the forest, home to mountain lions and threatened species such as the arroyo toad and the steelhead trout.

The Sierra Club wants to see other options tried first: creating more public transit, locating job centers closer to housing and improving existing roads. It fears that groundwater concerns would force at least part of the road above the surface.

Others also say a tunnel could threaten the forest's watersheds, centuries-old stands of oak and pine, and more than 20 threatened or endangered plants and animals.

Engineers say the tunnel would need elaborate filtering systems and ducts to keep exhaust fumes out of the forest — and the project's length makes that much harder.

In addition, the politically influential Irvine Co., the largest land developer in Orange County, has been skeptical of proposed routes through the forest, especially a tunnel, in part because company officials fear they would have to pay for road improvements.

Some public officials are equally wary.

"It's a simplistic answer," Riverside County Supervisor Bob Buster said. "The more I see of it — beware."

If the Cleveland National Forest is risky tunnel territory, the formidable San Gabriel range is much more so. Indeed, the tunnel and highway link through the mountains between the Los Angeles Basin and the Antelope Valley, the fastest-growing part of Los Angeles County, is the most ambitious — some would say farfetched — of the Southland projects.

Stretching for 23 miles through the San Gabriels, it would take at least six years to build. Its two tunnel segments — one of 4.5 miles, the other five — would be the longest and widest in the U.S. for automobiles.

"The [earthquake] faulting can be pretty daunting," said Roth, "but it's not insurmountable."

At the foothill level, the rock is likely to be crumbly and unstable — a possible risk in a serious earthquake, according to a 2003 Greek study. Indeed, parts of a tunnel on Turkey's Istanbul-Ankara highway collapsed after two 7.2-magnitude quakes in 1999.

Even if the project can be done, critics say, that doesn't mean it should be. Geologist Silver, who has studied the San Gabriels for 50 years, said it could be "prohibitively expensive and prohibitively dangerous."

Overall, the project would cost $3.1 billion, including $1.9 billion, or about $200 million a mile, for the tunnels alone, according to a preliminary study by URS Corp. Other experts said that figure could be low.

Whatever the cost, the project would not end traffic worries: The Antelope Valley corridor could handle just 60,500 trips a day — less than half of the Antelope Valley Freeway's expected volume in 2030, the study said. And tunnel use would drop nearly in half with high tolls.

Still, the relentless growth in the Antelope Valley might one day force the issue, several public officials said.

"This corridor," said Palmdale Public Works Director Leon Swain, "is an expensive proposition. But there will come a time when it will have to be seriously considered."